

T02D02 – 2.2 Mass Spec Practice MS

2.2 The mass spectrometer - 1 hour

2.2.1 Describe and explain the operation of a mass spectrometer. (3)

2.2.2 Describe how the mass spectrometer may be used to determine relative atomic mass using the ^{12}C scale. (2)

2.2.3 Calculate non-integer relative atomic masses and abundance of isotopes from given data. (2)

1. B(5)

2. B(6)

3. B(4)

4. B(3)

5. (a) (i) **(4x2)** ionization, acceleration, deflection/separation; 2*Award [1] for all three names and [1] for correct order.**Award [1] for two names in correct order.*(ii) **(5x1)** ionization: sample bombarded with high-energy or high-speed electrons/OWTTE;**(5x1)** acceleration: electric field/oppositely charged plates;**(5x1)** deflection: (electro)magnet/magnetic field; 3(b) (i) **(3x1)** average or (weighted) mean of masses of all isotopes of an element;**(5x1)** relative to (one atom of) ^{12}C ; 2*Both marks available from a suitable expression.*(ii) **(5x2)** $A_r = (70 \times 0.2260) + (72 \times 0.2545) + (74 \times 0.3673) + (76 \times 0.1522)$; $= 72.89$; 2*No other final answer acceptable.**Award [2] for correct final answer.*

[9]

6. (a) **(4x1)** 12 protons and 13 neutrons and 11 electrons; 1(b) **(6x1)** electric field/oppositely charged plates/potential difference/OWTTE; 1(c) **(6x1)** $^{25}\text{Mg}^+$;**(6x1)** greater m/z value/less highly charged ions need stronger fields to deflect them/OWTTE; 2*Do not accept greater mass with no reference to charge, or greater mass and smaller charge.*

[4]

Legend		T02D02 - 2.2 Practice (MC+FR)												
Level:	Needed	Grade	Possible	3		4		5		6		7		Cutoff
Above +6	0%	2	0	50%	1	40%	1.6	30%	2.1	20%	0.8	10%	0	6
Above +5	10%	3	2	80%	1.6	50%	2	40%	2.8	30%	1.2	20%	0	8
Above +4	20%	4	4	95%	1.9	80%	3.2	50%	3.5	40%	1.6	30%	0	10
Above +3	30%	5	7	100%	2	95%	3.8	80%	5.6	50%	2	40%	0	13
Above +2	40%	6	4	100%	2	100%	4	95%	6.65	80%	3.2	50%	0	16
Above +1	50%	7	0	100%	2	100%	4	100%	7	95%	3.8	80%	0	17
Level	80%	(not used for this assignment)												
Below -1	95%	Grade	Possible	3		4		5		6		7		Cutoff
Below -2	100%	2	0	50%	0	40%	0	30%	0	20%	0	10%	0	0
Below -3	100%	3	0	80%	0	50%	0	40%	0	30%	0	20%	0	0
Below -4	100%	4	0	95%	0	80%	0	50%	0	40%	0	30%	0	0
Below -5	100%	5	0	100%	0	95%	0	80%	0	50%	0	40%	0	0
Below -6	100%	6	0	100%	0	100%	0	95%	0	80%	0	50%	0	0
Below -7	100%	7	0	100%	0	100%	0	100%	0	95%	0	80%	0	0

*To understand this grade boundary, let's use a 5 as our example. In order to earn a score of a 5:

- Your "level" will be "5" on the left and you would need points in the following
 - 100% of all 3 and below material (below -2) – [two 3-level questions = 2 pts]
 - 95% of all 4 material (below -1) – [four 4-level questions = 3.8 pts]
 - 80% of all 5 material (level) – [seven 5-level questions = 5.6 pts]
 - 50% of all 6 material (above +1) – [four 6-level questions = 2 pts]
 - 40% of all 7 material (above +2) – [NO 7-level questions = 7 is not possible]
- The calculations at right help you to see how the grade boundary is calculated. It's in whole numbers rounded off.
- So, to obtain a 5 you need to have a minimum of 13 pts accumulated (IT IS NOT based on percentage)

** Pay attention to the difficulty of points you missed, also, highlight where on the syllabus that material is so that you can revisit as needed.